

occur with a frequency of >15% in all parts of the owl's range. In western hemlock and Douglas-fir forests, GLSA constitutes 47–58% of the biomass consumed, 3–4 times other species. In fall and winter, GLSA comprises 60–72% of biomass consumed. *Peromyscus* spp. and juvenile lagomorphs are 12–18% and 7%, respectively, of summer diets. In mixed-conifer forests in the southern part of the owl's range, *Neotoma fuscipes* may be up to 70% of the biomass consumed, and GLSA as little as 14%. Other species (% items consumed) are important locally: *Phenacomys longicaudus* (0–25%), *Neotoma cinerea* (0–15%), *Lepus americanus* (0–10%), *Clethrionomys* spp. (0–21%), *Peromyscus* spp. (5–31%), and *Thomomys mazama* (0–10%). There appears to be a definite selection of prey based on (1) nocturnality—otherwise *Tamiasciurus* and *Tamias* would be common prey; (2) mass of 100–400 g—adult lagomorphs are generally not taken and shrews, voles, and mice are low in frequency in diets relative to their abundance in the forest; (3) arboreality—GLSA is arboreal, *Neotoma* spp. are semi-arboreal, and *Phenacomys longicaudus* (27 g) is strictly arboreal and more frequently taken when available than the semi-arboreal *Peromyscus* (20 g) and the terrestrial *Clethrionomys* (23 g); arboreality probably relates to detectability of the prey; and (4) social behavior—the colonial *N. fuscipes* is locally concentrated in large numbers whereas the male-harem *N. cinerea* is locally concentrated in small numbers; *P. longicaudus* is also colonial, whereas *Peromyscus*, *Clethrionomys*, and GLSA are not. These characteristics seem to outweigh abundance: GLSA densities (mean number per ha  $\pm$  standard error) in old growth are  $0.21 \pm 0.09$  in the North Cascades of Washington,  $0.5 \pm 0.2$  on the Olympic Peninsula,  $2.3 \pm 0.3$  in the Western Cascades in Oregon, and  $1.9 \pm 0.1$  in the Oregon Coast Ranges and Klamath Mountains, yet GLSA constitutes a greater percentage of the diet in Washington than in southwestern Oregon. But GLSA is probably the most consistently available nocturnal species weighing 100–300 g in old-growth western hemlock and Douglas-fir forests. GLSA reaches its highest densities in old growth (3.7/ha) and is more than twice as abundant in old forest than other types in Washington and southwestern Oregon. The amount of old forest encompassed by spotted owls in their home ranges reflects the biomass of the medium-sized prey (GLSA and *Neotoma* spp.) in old growth. Spotted owls can depress GLSA population densities by almost 50% in areas intensively used for foraging.

#### A PRIVATE LANDOWNER'S HABITAT CONSERVATION PLAN: THE SIMPSON TIMBER COMPANY HCP

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In July 1990, the listing of the northern spotted owl (*Strix occidentalis caurina*) as threatened under the federal Endangered Species Act prohibited "taking" of the species.

In response to this listing, the California Board of Forestry adopted regulations to avoid a take of the owls. Among other things, these regulations required retention of 500 acres of spotted owl habitat within a 985-acre (0.7-mile) circle centered on a known pair. High densities of owls (gross density approximately 1 pair/1000 acres) in and adjacent to merchantable timber stands in northern California of Simpson Timber Company created a situation in which continuing timber harvest and avoiding a take were not possible. This prompted Simpson to seek a permit from the U.S. Fish and Wildlife Service to allow take of spotted owls incidental to its timber harvest operations. As part of the permit application, the company drafted a Habitat Conservation Plan (HCP) for the owl. Intensive surveys and analysis of nesting sites and stands indicated that spotted owls on and adjacent to Simpson property were recolonizing and successfully reproducing in stands as early as 35–45 years following harvest. The results of these studies were used to project future owl habitat and develop the major premise of the HCP: that even when timber harvest was accounted for, potential owl habitat would more than double over a 30-year planning period. In addition, the plan included several other conservation strategies including setting aside 39 areas totalling 13 000 acres where timber harvest would not occur, establishing a 35 000 acre "Special Management Area" that would maintain at least 20 pairs of owls and where "no take" of owls would occur, continuing the spotted owl research program, and managing stands to accelerate the development of future owl habitat.

#### DEMOGRAPHIC STUDIES OF NORTHERN SPOTTED OWLS

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Between 1985 and 1987, 5 different demographic studies were initiated to determine population parameters of northern spotted owls. These studies include the Willow Creek Study in northwestern California, Medford BLM Study in southwestern Oregon, Rosenberg BLM and H. J. Andrews Studies in western Oregon, and the Olympic Peninsula Study in western Washington. All 5 studies used mark-recapture techniques to assess age and sex-specific survival rates. Fecundity was assessed by counting the number of young that left the nest. Population growth rates ( $\lambda$ ) were calculated based on birth and death rates of females. Estimates of  $\lambda$  indicated that populations in all 5 study areas were declining. Furthermore, a meta-analysis in which estimates from all 5 areas were examined together, indicated a decreasing trend in annual adult female survival. This suggested that the rate of population decline was accelerating. Although the results of these analyses are alarming, I believe that they should be viewed with caution. A number of potential biases exist that could make things look worse than they really are. Probably the biggest concern is that survival rates may be